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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/955,076	09/19/2001	Eiji Sakagami	214019US2	9771

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EXAMINER	
WEISS, HOWARD	

ART UNIT	PAPER NUMBER
2814	

DATE MAILED: 01/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/955,076	SAKAGAMI, EIJI	
	Examiner	Art Unit	
	Howard Weiss	2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 October 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) *7-21* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *1-21* are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Attorney's Docket Number: 214019US2

Filing Date: 9/19/01

Continuing Data: RCE established 5/8/03 and 4/26/04

Claimed Foreign Priority Date: 9/21/00 (JPX)

Applicant(s): Sakagami

Examiner: Howard Weiss

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1 to 3, 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fang (U.S. Patent No. 6,023,085), Reisinger (U.S. Patent No. 6,137,718), Pradeep et al. (U.S. Patent No. 6,228,713), and Jang et al. (U.S. Patent No. 5,786,262).

Fang shows most aspects of the instant invention (e.g. Figures 7 and 9) including:

- a semiconductor substrate **304**
- a first cell transistor **346** including a first gate insulating film **308**, a charge storage layer **316a** and a first gate electrode **338** said charge storage layer existing only below the first gate electrode
- a second selection transistor **344** including a second gate insulating film **336** and a second gate electrode **338** laterally separate form the first gate electrode
- peripheral transistors **332, 342** with gate electrodes **338** and gate insulting films **337,336** of different thicknesses

Ogura et al. do not show the first and second transistor isolated by a trench, a bottom insulating film formed on the trench inner surface and an insulating layer

filling said trench on said bottom insulating layer, said first gate insulating film comprising a silicon oxide/silicon nitride/silicon oxide (ONO) multi-film structure with the silicon nitride film as said charge storage layer, the height of the charge storage layer above the substrate lower than the height of the material filling said trench and the width of the charge storage layer corresponding to a width of the element region and a thickness of the bottom insulating film.

Reisinger teaches (e.g. Figure 1 and Column 5 Lines 45 to 56) to form an ONO gate insulating layer **5** with a silicon nitride layer **52** as a charge storage layer, the thicknesses of said layers within the claimed ranges and the thickness of the bottom oxide layer **51** smaller than the top oxide layer **53** to increase storage density and data retention (Column 2 Lines 7 to 12). It would have been obvious to a person of ordinary skill in the art at the time of invention to form an ONO gate insulating layer with a silicon nitride layer as a charge storage layer, the thicknesses within the claimed ranges and the thickness of the bottom oxide layer is smaller than the top oxide layer as taught by Reisinger in the device of Fang to increase storage density and data retention.

Pradeep et al. teach (e.g. Figure 7A) to isolate memory cells with trench isolations **24** in element isolation regions with the charge storage layer **14** with a height lower than the trench isolations and restricted from said element isolation regions to reduce the masking and etching steps and create a self-aligned structure (Column 1 Lines 49 to 53). It would have been obvious to a person of ordinary skill in the art at the time of invention to isolate memory cells with trench isolations in element isolation regions with the charge storage layer with a height lower than the trench isolations and restricted from said element isolation regions as taught by Pradeep et al. in the device of Fang to reduce the masking and etching steps and create a self-aligned structure.

Jang et al. teach (e.g. Figure 10) to form a bottom insulating layer **14** in a trench's inner surface **10** (Figure 8) to provide better isolation (Column 4 Lines 31 to 38). The Examiner notes that the position of the bottom insulating layer of Jang et al. when combined with the features of the prior art above, the width of the charge storage layer will correspond to a width of an element region and a thickness of the bottom insulating film. It would have been obvious to a person of ordinary skill in the art at the time of invention to form a bottom insulating layer in a trench's inner surface so the width of the charge storage layer will correspond to a width of an element region and a thickness of the bottom insulating film as taught by Jang et al. in the device of Fang to provide better isolation.

3. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fang, Pradeep et al., Jang et al. and Reisinger, as applied to Claim 1 above, and further in view of Agarwal et al. (U.S. Patent No. 6,201,276)

Fang, Pradeep et al., Jang et al. and Reisinger disclose the claimed invention (Paragraph 2) except that the charge storage layer comprising either a silicon nitride or a tantalum oxide film instead of either a strontium titanate or a barium strontium titanate film. Agarwal et al. teach (Column 4 Lines 33 to 36) that either a strontium titinate or a barium strontium titanate film are equivalent structure known in the art. Therefore, because these charge storage films were art-recognized equivalents at the time the invention was made, one of ordinary skill in the art would have found it obvious to substitute either silicon nitride or tantalum oxide for strontium titinate or barium strontium titanate.

Response to Arguments

4. Applicant's arguments filed 10/22/04 have been fully considered but they are not persuasive. In reference to the thickness relationship of the top and bottom oxide layers, as long as the relationship of the thicknesses of the oxide layers can be

satisfied with the stated ranges given by Reisinger, it is a mater of design choice and the prior art meets the claim limitation. For example, a thickness of 5 nm for the bottom oxide layer and 6.5 nm for the top oxide layer meets the claim limitation and is within the stated ranges in Reisinger. Additionally, Reisinger does show the other limitations as stated in the rejection above.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). For example, Jang et al. teach to form a bottom insulating layer **14** in a trench's inner surface **10** (Figure 8) to provide better isolation (Column 4 Lines 31 to 38). This advantage does not depend upon the other features of Jang et al.'s invention and, when combined with the other prior art, make obvious the instant invention as claimed. In view of these reasons and those set forth in the present office action, the rejections of the stated claims stand.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

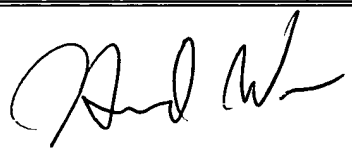
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Papers related to this application may be submitted directly to Art Unit 2814 by facsimile transmission. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (15 November 1989). The Art Unit 2814 Fax Center number is **(703) 872-9306**. The Art Unit 2814 Fax Center is to be used only for papers related to Art Unit 2814 applications.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard Weiss at **(571) 272-1720** and between the hours of 8:00 AM to 4:00 PM (Eastern Standard Time) Monday through Friday or by e-mail via **Howard.Weiss@uspto.gov**.

8. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass(es): 257/ 324,326	thru 1/5/05
Other Documentation: none	
Electronic Database(s): EAST	thru 1/5/05



Howard Weiss
Primary Examiner
Art Unit 2814

HW/hw
5 January 2005